CLAIMPTO

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31. (Currently Amended) A mutant SPE-A toxin, the mutant SPE-A toxin comprising two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, or cysteine-98 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids;~~

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

32. (Currently Amended) The mutant SPE-A toxin of claim 31, wherein the substitutions comprise the substitution of asparagine-20 of SEQ ID NO: 14 to aspartic acid, glutamic acid, lysine or arginine; the substitution of leucine-41 of SEQ ID NO: 14 to alanine; the substitution of leucine-42 of SEQ ID NO: 14 to alanine; the substitution of cysteine-98 of SEQ ID NO: 14 to serine, alanine, glycine, or threonine; or the substitution of aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine~~; or substitutions at more than one of these residues~~.

33. (Currently Amended) The mutant SPE-A toxin of claim 32, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, cysteine-98 of SEQ ID NO: 14 to serine, or aspartic acid-45 of SEQ ID NO: 14 to asparagine~~, or more than one of these substitutions~~.

34. (Previously Presented) The mutant SPE-A toxin of claim 31, wherein the substitutions comprise substitution of asparagine-20 of SEQ ID NO: 14, of cysteine-98 of SEQ ID NO: 14, or of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

35. (Previously Presented) The mutant SPE-A toxin of claim 34, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

36. (Previously Presented) The mutant SPE-A toxin of claim 34, further comprising substitution of aspartic acid-45 of SEQ ID NO: 14, lysine-157 of SEQ ID NO: 14, or of both aspartic acid-45 of SEQ ID NO: 14 and lysine-157 of SEQ ID NO: 14.

37. (Previously Presented) The mutant SPE-A toxin of claim 36, wherein the substitutions comprise aspartic acid-45 of SEQ ID NO: 14 to asparagine or lysine-157 of SEQ ID NO: 14 to glutamic acid.

44. (Currently amended) The mutant SPE-A toxin of claim 36 43, wherein the substitutions comprise aspartic acid-45 of SEQ ID NO: 14 to asparagine, lysine-157 of SEQ ID NO: 14 to glutamic acid, or both aspartic acid-45 of SEQ ID NO: 14 to asparagine and lysine-157 of SEQ ID NO: 14 to glutamic acid.

45. (Previously Presented) The mutant SPE-A toxin of claim 31, wherein the mutant has at least one of the following characteristics: the mutant has a decrease in mitogenicity for T-cells, the mutant does not enhance endotoxin shock, the mutant is not lethal, or the mutant is nonlethal but retains mitogenicity comparable to that of the wild type SPE-A toxin.

81. (Previously Presented) The mutant SPE-A toxin of claim 31, further comprising amino acid substitutions at residue lysine-157 of SEQ ID NO: 14.

82. (Previously Presented) The mutant SPE-A toxin of claim 81, comprising amino acid substitutions lysine-157 of SEQ ID NO: 14 to glutamate and asparagine 20 of SEQ ID NO: 14 to aspartic acid.

83. (Previously Presented) The mutant SPE-A toxin of claim 31, comprising amino acid substitutions at residues asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, and cysteine-98 of SEQ ID NO: 14.

85. (Previously Presented) The mutant SPE-A toxin of claim 83, comprising amino acid substitutions of residue asparagine 20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, aspartic acid-45 of SEQ ID NO: 14 to asparagine, and cysteine-98 of SEQ ID NO: 14 to serine.

46. (Currently Amended) A vaccine for protecting animals against at least one biological activity of wild-type SPE-A comprising: an effective amount of a mutant SPE-A toxin comprising two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, or cysteine-98 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids;~~

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

48. (Previously Presented) A method for protecting an animal against at least one biological activity of a wild type SPE-A comprising: administering a vaccine according to claim 46 to an animal.

49. (Previously Presented) A method for reducing symptoms associated with toxic shock comprising: administering a vaccine according to claim 46 to an animal.

47. (Currently Amended) A pharmaceutical composition comprising: a mutant SPE-A toxin in admixture with a physiologically acceptable carrier, wherein the mutant SPE-A toxin comprises two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, aspartic acid-45 of SEQ ID NO: 14, or cysteine-98 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids,~~

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

51. (Currently Amended) A mutant SPE-A toxin, the mutant SPE-A toxin comprising one to six amino acid substitutions; and

wherein the substituted amino acids comprise leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, or aspartic acid 45 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids,~~

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

52. (Currently Amended) The mutant SPE-A toxin of claim 51, wherein the substitution comprises leucine-41 of SEQ ID NO: 14 to alanine; leucine-42 of SEQ ID NO: 14 to alanine; or aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine; ~~or substitution at more than one of these amino acids.~~

53. (Previously Presented) The mutant SPE-A toxin of claim 51, wherein the substitution comprises aspartic acid-45 of SEQ ID NO: 14 to asparagine.

54. (Previously Presented) The mutant SPE-A toxin of claim 53, further comprising substitution of asparagine-20 of SEQ ID NO: 14, substitution of cysteine-98 of SEQ ID NO: 14, or substitution of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

55. (Previously Presented) The mutant SPE-A toxin of claim 54, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

57. (Currently Amended) The mutant SPE-A toxin of claim 51, wherein the mutant SPE-A toxin comprises two to six amino acid substitutions; and

wherein the substituted amino acids comprise asparagine-20 of SEQ ID NO: 14, leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, or aspartic acid 45 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids.~~

58. (Currently Amended) The mutant SPE-A toxin of claim 57, wherein the substitutions comprise substitution of asparagine-20 of SEQ ID NO: 14 to aspartic acid, glutamic acid, lysine or arginine; substitution of leucine-41 of SEQ ID NO: 14 to alanine; the substitution of leucine-42 of SEQ ID NO: 14 to alanine; or substitution of aspartic acid-45 of SEQ ID NO: 14 to asparagine, glutamine, serine, threonine, or alanine~~; or substitution at more than one of these amino acids~~.

59. (Currently Amended) The mutant SPE-A toxin of claim 58, wherein the amino acid substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, leucine-41 of SEQ ID NO: 14 to alanine, leucine-42 of SEQ ID NO: 14 to alanine, cysteine-98 of SEQ ID NO: 14 to serine, or aspartic acid-45 of SEQ ID NO: 14 to asparagine~~, or substitution at more than one of these amino acids~~.

61. (Previously Presented) The mutant SPE-A toxin of claim 51, comprising substitutions at asparagine-20 of SEQ ID NO: 14, at cysteine-98 of SEQ ID NO: 14, or of both asparagine-20 of SEQ ID NO: 14 and cysteine-98 of SEQ ID NO: 14.

62. (Previously Presented) The mutant SPE-A toxin of claim 61, wherein the substitutions comprise asparagine-20 of SEQ ID NO: 14 to aspartic acid, cysteine-98 of SEQ ID NO: 14 to serine, or both asparagine-20 of SEQ ID NO: 14 to aspartic acid and cysteine-98 of SEQ ID NO: 14 to serine.

63. (Previously Presented) The mutant SPE-A toxin of claim 51, further comprising a substitution at a cysteine.

72. (Previously Presented) The mutant SPE-A toxin of claim 51, wherein the mutant has at least one of the following characteristics: the mutant has a decrease in mitogenicity for T-cells, the mutant does not enhance endotoxin shock, the mutant is not lethal, or the mutant is nonlethal but retains mitogenicity comparable to that of the wild type SPE-A toxin.

73. (Currently Amended) A vaccine for protecting animals against at least one biological activity of wild-type SPE-A comprising: an effective amount of a mutant SPE-A toxin comprising one to six amino acid substitutions; and

wherein the substituted amino acids comprise leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, or aspartic acid 45 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids,~~

wherein the mutant is nonlethal compared to wild type SPE-A toxin.

75. (Previously Presented) A method for protecting an animal against at least one biological activity of a wild type SPE-A comprising: administering a vaccine according to claim 73 to an animal.

76. (Previously Presented) A method for reducing symptoms associated with toxic shock comprising: administering a vaccine according to claim 73 to an animal.

74. (Currently Amended) A pharmaceutical composition comprising: a mutant SPE-A in admixture with a physiologically acceptable carrier, wherein the mutant SPE-A toxin comprises one to six amino acid substitutions; and

wherein the substituted amino acids comprise leucine-41 of SEQ ID NO: 14, leucine-42 of SEQ ID NO: 14, or aspartic acid 45 of SEQ ID NO: 14, ~~or substitution at more than one of these amino acids,~~

wherein the mutant is nonlethal compared to wild type SPE-A toxin.